Coastal Hazardous Waste Site REVIEWS

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LCP Chemicals, Inc.

Linden, New Jersey
CERCLIS #NJD079303020

Site Exposure Potential

The LCP Chemicals Inc. (LCP) property covers about 10 hectares in an industrial area of the Tremley Point Peninsula next to the Arthur Kill in Linden, Union County, New Jersey (Figure 1). The site is drained by South Branch Creek, which flows southeast for about 0.5 km before entering Arthur Kill, which then flows southward about 16 km before discharging into Raritan Bay (Figure 1).

The manufacturing facility was used for chlorine production from 1952 to 1985, but wasn't acquired by LCP until 1972 (Simmons, 1998). LCP operated mercury electrolysis cells to produce chlorine, sodium hydroxide, hydrochloric acid, and anhydrous hydrogen chloride. These processes generated mercury-tainted sludge, which was placed into the brine sludge lagoon (BSL; Figure 2).

As much as 18 metric tons of combined sludges from the mercury cell process and wastewater treatment were placed into the BSL daily. Supernatant from the southeast corner of the lagoon was piped to the wastewater treatment system. Stormwater runoff, equipment washdown and structure washdown also were sent to the wastewater treatment system (Eder Associates 1992). Under a NJPDES permit, treated wastewater discharged through an outfall extending into the

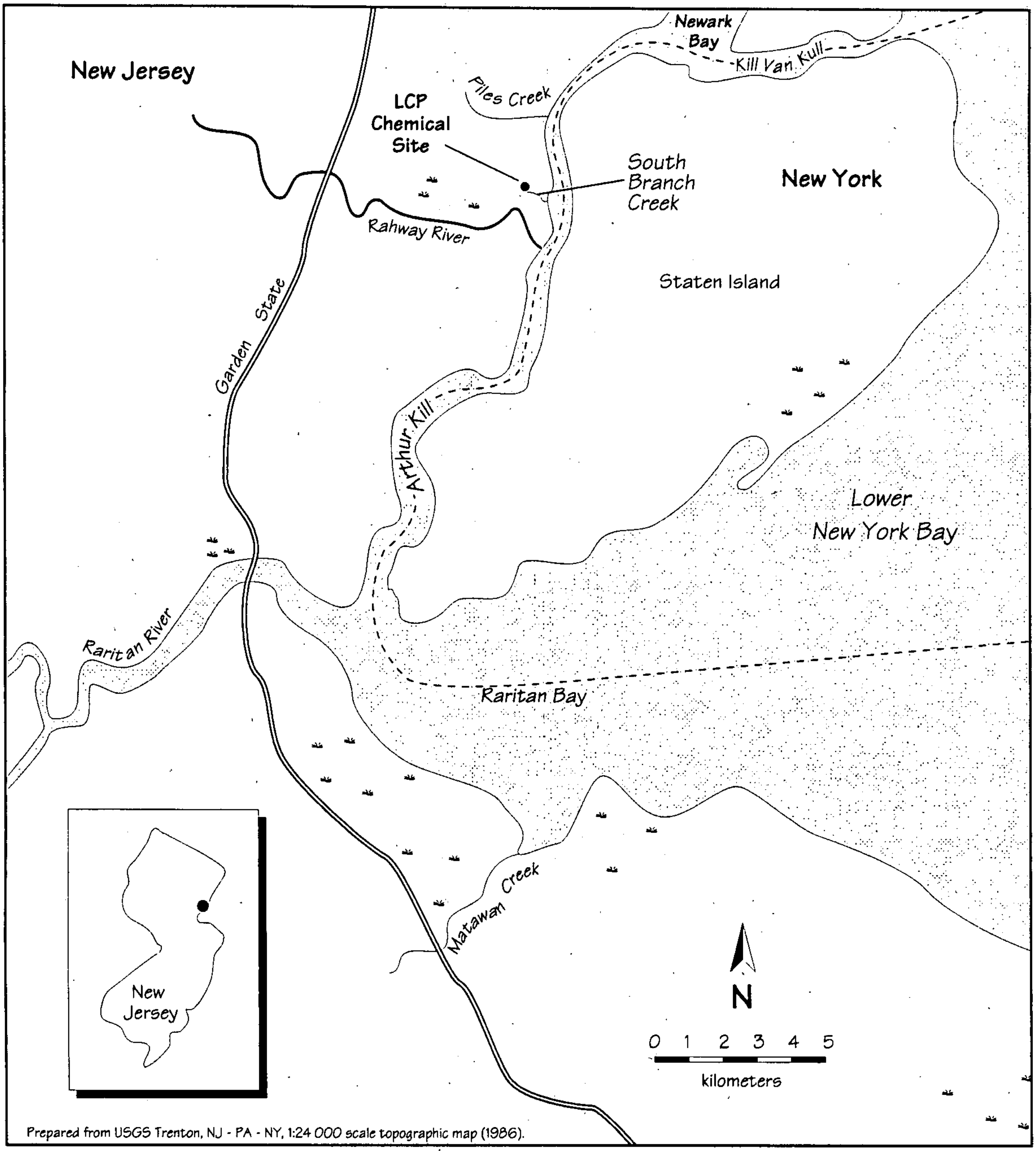

Figure 1. Location of LCP Chemicals site in Linden, New Jersey.

head of South Branch Creek (Figure 2). Unpermitted overland discharges of brine from the BSL to South Branch Creek were documented on four occasions from 1972 to 1979. These discharges probably contributed to documented contamination in soils downslope of the BSL and in South Branch Creek sediments next to the site.

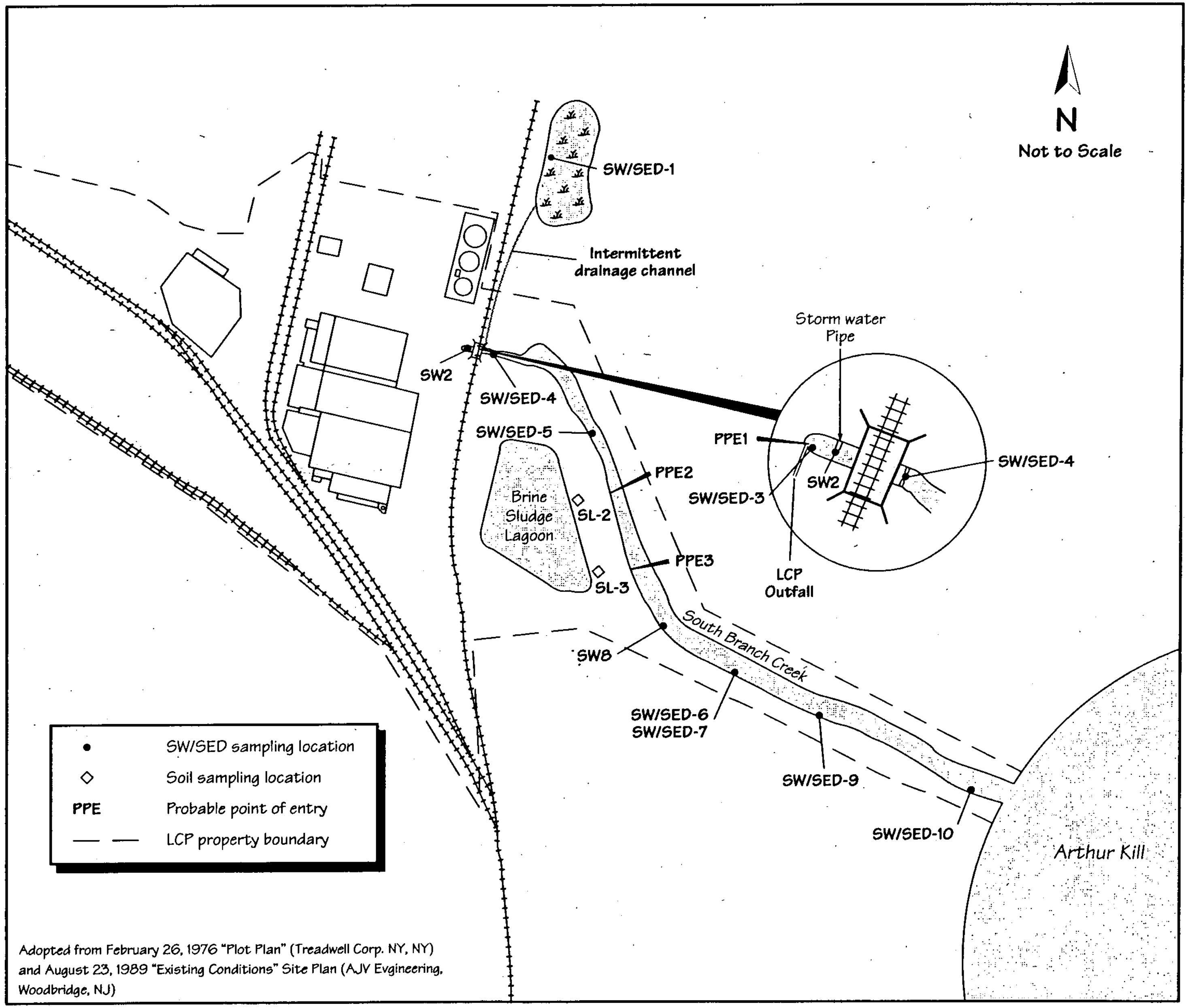

Figure 2. Details of the LCP Chemicals site in Linden, New Jersey.

Closure of the BSL in 1984 consisted of lagoon dewatering, sediment compaction, and placement of a multi-layer cap. The cap consisted of 60-cm of clay, 15 cm of drainage media, 15 cm of soil, and vegetative cover. Although production facilities also were closed in 1984, the site continued to operate as a storage and transfer station, west of the BSL, for hydrochloric acid, sodium hydroxide, potassium hydroxide, and methylene chloride produced at other LCP facilities.

Contaminants migrated from the site to South Branch Creek via overland runoff and erosion associated with overflows and breaches of the BSL, and permitted discharges through the outfall. Overland runoff resulted in numerous probable points of entry (PPEs) into the creek, two of which (PPE2 and PPE3 in Figure 2) were evaluated in greater detail during EPA's Hazard Ranking System (HRS) evaluation (EPA 1997). The groundwater pathway was not evaluated for the HRS analysis because human contact with potentially contaminated groundwater was considered unlikely. The water table is 1.7 to 3.4 m below ground surface and is located in a layer of unconsolidated fill consisting of mixed silt, sand, gravel, cinders, and crushed stone and brick (Geraghty and Miller 1982). Groundwater from the site discharges directly to South Branch Creek (Eder Associates 1992).

NOAA Trust Habitats and Species

The habitats of concern to NOAA are the sediments, intertidal mudflats, and wetlands associated with South Branch Creek and Arthur Kill. Arthur Kill is a heavily industrialized tidal estuary that includes extensive intertidal mudflats and salt marsh wetlands. Many of these wetlands were damaged in a 1990 oil spill and are being restored under the direction of the New York Department of Parks and Recreation (Packer 1998). There are salt marshes on both banks of South Branch Creek (EPA 1997). Important shallow-water habitats along the shorelines of both Arthur Kill and South Branch Creek generally have unconsolidated bottoms of silt or sand that are suitable habitat for a benthic community including polychaetes, mud crabs, and other shellfish species (U.S. ACOE 1997).

Despite the widespread anthropogenic influence on the Arthur Kill estuary, there are numerous anadromous and marine/estuarine fish species there (Table 1). Arthur Kill is a migration corridor between the New York Bight and the Newark Bay/Upper New York Bay estuary (U.S. ACOE 1997). Many transient marine/estuarine species enter the area on a seasonal basis from nearby coastal waters (U.S. ACOE 1997). A small number of species (e.g., striped bass, winter flounder, summer flounder, bay anchovy) dominate the fish community on a seasonal basis, but numerous other species occur as small resident populations.

Table 1. NOAA trust species using habitats associated with the Arthur Kill estuary near the site.

Species		Habitat Use			Fisheries	
Common Name	Scientific Name	Spawning Ground	Nursery Ground	Adult Forage	Comm. Fishery	Recr. Fishery
ANADROMOUS/CATADROMOUS SPECIES						
Atlantic sturgeon	*Acipenser oxyrhynchus*			♦		
Blueback herring	*Alosa aestivalis*		♦	♦		
Alewife	*Alosa pseudoharengus*		♦	♦		
American shad	*Alosa sapidissima*		♦	♦		
American eel	*Anguilla rostrata*		♦	♦		
Striped bass	*Morone saxatilis*			♦		
Rainbow smelt	*Osmerus mordax*		♦	♦		
MARINE/ESTUARINE SPECIES						
Bay anchovy	*Anchoa mitchilli*		♦	♦		
Atlantic menhaden	*Brevoortia tyrannus*		♦	♦		♦
Crevalle jack	*Caranx hippos*		♦	♦		
Atlantic herring	*Clupea harengus*		♦			
Weakfish	*Cynoscion regalis*		♦	♦		
Gizzard shad	*Dorosoma cepedianum*		♦	♦		
Mummichog	*Fundulus heteroclitus*	♦	♦	♦		
Striped killifish	*Fundulus majalis*	♦	♦	♦		
Gobies	*Gobiosoma spp.*	♦	♦	♦		
Spot	*Leiostomus xanthurus*		♦	♦		
Inland silverside	*Menidia beryllina*	♦	♦	♦		
Atlantic silverside	*Menidia menidia*	♦	♦	♦		
Atlantic tomcod	*Microgadus tomcod*	♦	♦	♦		♦
Atlantic croaker	*Micropogonius undulatus*		♦			
White perch	*Morone americana*	♦	♦	♦		♦
Grubby	*Myoxocephalus aenaeus*	♦	♦	♦		
Summer flounder	*Paralichthys dentatus*		♦	♦		♦
Butterfish	*Peprilus triacanthus*		♦			
Winter flounder	*Pleuronectes americanus*	♦	♦	♦		♦
Black drum	*Pogonias cromis*		♦			
Bluefish	*Pomatus saltatrix*		♦	♦		♦
Northern searobin	*Prionotus carolinus*		♦			
Scup	*Stenotomus chrysops*	♦	♦	♦		
Northern pipefish	*Syngnathus fuscus*	♦	♦	♦		
Tautog	*Tautoga onitis*		♦			
Cunner	*Tautogolabrus adspersus*		♦			
Hogchoker	*Trinectes maculatus*		♦			
Red hake	*Urophycis chuss*		♦			
INVERTEBRATE SPECIES						
Blue crab	*Callinectes sapidus*	♦	♦	♦		♦
Sand shrimp	*Crangon septemspinosa*	♦	♦	♦		
Hardshell clam	*Mercenaria mercenaria*	♦	♦	♦		
Softshell clam	*Mya arenaria*	♦	♦	♦		
Grass shrimp	*Palaemonetes pugio*	♦	♦	♦		
Brown shrimp	*Penaeus aztecus*			♦		

Source: Bragin (1988), USACOE (1997)

White perch, American eel, mummichog, and shrimp, are NOAA trust species that are likely to be found in South Branch Creek. Although no fish community data could be located for the Creek, these species have been observed in other small creek systems entering Arthur Kill (Byrne 1998; Packer 1998).

The New Jersey Department of Health maintains consumption advisories for striped bass, bluefish, white catfish, American eel, white perch, and blue crab because of high PCB and dioxin/furan concentrations in fish and crabs from Arthur Kill and its tributaries (NJ Dept. of Fish & Wildlife 1998). In spite of this advisory, some recreational fishing continues from easily accessible points along the banks of Arthur Kill (Byrne 1998).

Site-Related Contamination

Data on site-related contamination were obtained from the HRS evaluation (EPA 1997), which included results of a 1995 EPA site inspection (SI), and summarized results from previous investigations. All data in the HRS report before the SI are at least ten years old except for monitoring well data. While the older data documents historical conditions and releases, it may not accurately characterize current exposure potential. Therefore, only the SI data are presented in this review. The HRS report indicates that mercury is the primary contaminant of concern. However, several other trace elements and PCBs have been measured at concentrations exceeding screening guidelines (Table 2).

Maximum concentrations of mercury exceeded screening guidelines by factors of almost 2,000 for soil and over 7,000 for surface water and sediment. The ratios by which concentrations of other trace elements exceeded screening guidelines were much lower; most did not exceed 100. Mercury concentrations in soil immediately downslope of the BSL exceeded 100 mg/kg. During a 1982 investigation, mercury concentrations in surface soil adjacent to the BSL were as high as 1,580 mg/kg (Geraghty and Miller 1982). The maximum mercury concentrations in surface water and sediment were found in South Branch Creek next to the outfall. Mercury concentrations generally declined in a downstream direction (toward Arthur Kill), but concentrations at the station farthest downstream (SW-SED-10) still exceeded screening guidelines by factors of over 300 for both surface water and sediments. Therefore, it has been estimated that estuarine emergent wetlands located along approximately 0.74 km of South Branch Creek shoreline (measuring each bank separately) are located within the zone of high mercury contamination (EPA 1997).

Groundwater was monitored quarterly after the closure of the BSL, and it is reported that these data do not indicate a release of mercury from the lagoon to groundwater. However, these data were not available for review (Eder Associates 1992). Because the tidal cycle causes reversing hydraulic gradients, i.e., tidal pumping, and because salt water and fresh water are mixed within the surface aquifer, groundwater data from this site are difficult to interpret. That is, the reversing hydraulic (tidal) gradient may carry contaminants to hydrologically "upgradient" locations, making it difficult to establish background concentrations at this site (Geraghty and Miller 1982).

Table 2. Maximum contaminant concentrations of concern in soil, sediment, and surface water samples from 1995 site investigation at the LCP Chemicals site compared to NOAA screening guidelines (EPA 1997).

	Soil mg/kg	Avg. U.S. [a] mg/kg	Surface water µg/L	AWQC [b] µg/L	Sediment mg/kg	ERL [c] mg/kg
PCBs	12.0	NA	NT	0.03	NT	22.7
Antimony	5.4	0.48	ND	500.0[p]	7.0	NA
Arsenic	17.0	5.2	336.0	36.0	318.0	8.2
Barium	2,110.0	440.0	9,580.0	NA	36,300.0	NA
Cadmium	0.44	0.06[a]	33.0	9.3	132.0	1.2
Chromium	19.1	37.0	231.0	50.0	263.0	81.0
Cobalt	17.9	6.7	22.9	NA	32.8	NA
Copper	156.0	17.0	520.0	2.9[d]	389.0	34.0
Iron	16,500.0	18,000.0	53,800.0	NA	57,300.0	NA
Lead	304.0	16.0	446.0	8.5	617.0	46.7
Mercury	110.0	0.058	93.0	0.025	1,060.0	0.15
Nickel	20.8	13.0	60.6	8.3	52.9	20.9
Selenium	0.89	0.26	4.9	71.0	10.2	NA
Silver	37.0	0.05[a]	8.3	0.92[p]	4.9	1.0
Zinc	833.0	48.0	1,440.0	86.0	12,500.0	150.0

NA Not Available.
NT Not tested.
a: Shacklette and Boerngen (1984), except for silver and cadmium which are averge concentrations in the earth's crust as reported by Lindsay (1979).
b: Ambient Water Quality Criteria, Marine Chronic unless noted otherwise (EPA 1993).
c: Effects Range-Low: The 10th percentile concentration for the dataset in which effects were observed or predicted as compiled by Long et al (1995)
d: Acute criterion; chronic criterion not available.
p: Proposed criterion.

Environmental samples were not analyzed for organic contaminants during the recent SI. Solvents were used for cleaning machine parts (e.g., carbon tetrachloride, acetone, and methyl ethyl ketone) and may be present at the site (Eder Associates 1992). Unidentified organic vapors were noted in the headspace of several monitoring wells during 1987 and 1989 site inspections (Eder Associates 1992). Volatile organic compounds also were noted in soil samples collected near the BSL during a 1988 investigation (Eder Associates 1992). In addition, Aroclor 1254, a commercial mixture of

PCB congeners, was measured in soil samples collected near the BSL at concentrations as high as 12 mg/kg during a 1992 investigation (Eder Associates 1992). Surface water and sediment samples were not analyzed for PCBs.

Summary

LCP Chemicals used a mercury cell electrolysis process to produce chlorine and other chemicals. Mercury-tainted sludge from the process was placed in the brine sludge lagoon, next to a small tributary of the Arthur Kill called South Branch Creek. Several anadromous and marine/estuarine fish species may be found in Arthur Kill; mummichog, white perch, American eel, and shrimp are likely to be found in South Branch Creek. Very high concentrations of mercury and several other trace elements have been reported from surface waters and sediments in South Branch Creek. PCBs and VOCs have been observed at the site, but site surface water and sediment have not been tested for these contaminants.

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